
B. PARALLEL SESSIONS

1. PARALLEL SESSION 5.1 – CONSERVATION AGRICULTURE

PS-5.1-01

Cover Crops Reduce Water Drainage in Temperate Climate. A Meta-Analysis

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Abstract: Cover crops are grown during fallow period between two main cash crops and biomass is returned to the soil at their destruction. They provide many ecosystem services such as nitrate leaching reduction or green manure effect. However, the impact of these multi-services cover crops on water balance is poorly studied. Some papers reported an increased evapotranspiration due to an increase of plant transpiration that could decrease water drainage. Nevertheless, there is no consensus on the intensity of their impact on water budget. Less drainage could reduce groundwater water recharge, which can be a crucial issue, particularly in dry regions and in a climate change context with more frequent drought. Since the impact of cover crops on water cycle and drainage can be a serious disservice, particularly if generalized over large spatial area, our objective was to study the effect of cover crops on drainage through a meta-analysis.

We carried out a meta-analysis to compare drainage under cover crops versus bare soil in temperate climates. From an initial database of more than 280 references, we selected 34 studies having available data on drainage, including a comparison between cover crops and bare soil at field scale from both experiments and modelling study.

Despite high variability of climate, soil, and cover crop management, cover crops reduced water drainage in more than 90% of the 34 studies. The mean effect size reported a water drainage reduction of 31 mm with a confidence interval at 95% between 41 mm and 22 mm. This reduction indicates that evapotranspiration was higher with cover crops compared to a bare soil, the reduction of soil evaporation by the plant cover being lower than the cover crop transpiration. A slight higher reduction of drainage was obtained for modeling results than for field measurements, as well as for cover crops sown during summer than during autumn and on medium soil texture than on loamy or clay soils. However, these trends were not significantly different due to the low number of studies for each situation. More experiments with close monitoring throughout the fallow period are needed to determinate the water flux modification explaining the drainage reduction by cover crops. Modelling could also be a complementary tool for analyzing and quantifying the water dynamics on a wide range of pedoclimatic conditions, as a first work for proposing optimal managements of cover crops avoiding a too strong reduction of drainage in dry regions where groundwater recharge is a crucial issue.

Keywords: Catch crops; Review; Groundwater recharge; Water balance

PS-5.1-02

Cover Crops for Improving Nitrogen Budget in Crop Rotation

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Abstract: There are numerous benefits that cover crops bring into the cropping systems and they are mainly related to the improved soil properties. Legume cover crops are the most efficient in enhancing cash crop yields compared with fallows or other cover crop species. Benefits of cover crops depend on agroecological conditions. The aim of this research was to determine the effect of cover crops and ways of their use (forage and green manure) on the nitrogen budget.

A field experiment was conducted between 2011 and 2013 at three locations in Vojvodina Province, north part of Serbia. The experiment was conducted as a random block design with three replicates and included 1) sole cover crop of common vetch (*Vicia sativa* L.), 2) sole cover crop of triticale (x *Triticosecale* Wittm. ex A. Camus), 3) mixture of common vetch and triticale, 4) no cover crop with 80 kg N ha⁻¹, 5) no cover crop with 160 kg N ha⁻¹ and 6) control treatment without cover crop and N fertilization. Cover crops were used as forage and green manure. Winter cover crops were planted in the first half of October of 2011 and 2012, ploughed-in in mid-May 2012 and 2013 afterward, silage corn was sown. Nitrogen was applied together with ploughing-in. The nitrogen remaining in the soil following the corn crop was calculated by the use of formula which includes nitrogen in the cover crop, soil mineral nitrogen at silage corn sowing, nitrogen added with fertilization, nitrogen mineralization potential of soils and nitrogen taken up in above ground silage corn yield.

The weather conditions significantly differed from year to year in the amount and distribution of precipitation and affected nitrogen in the soil. However, the nitrogen budget was significantly higher in the treatments with cover crops used as green manure. Based on the two-year average, the treatments with triticale and vetch had approximately the same values (93.93 and 94.44 kg ha⁻¹), while the highest nitrogen budget was recorded in the treatment with the mixture (105.53 kg ha⁻¹). Even though cereal had a higher yield less nitrogen was expected to remain in the soil given the fact that cereals have a higher C/N ratio and release nitrogen more slowly than legumes. It was noted that the fertilization treatments and the control had significantly lower average values of residual nitrogen. The results indicate that in the average year like 2013 winter cover crops can provide both positive effects on the subsequent crop as well as on nitrogen conservation.

Keywords: cover crop, legumes, nitrogen budget, silage corn, yield



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ABSTRACT BOOK



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